

The Role of the Information Architect at King Faisal Specialist Hospital and Research Centre

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ABSTRACT

Successful implementation of integrated clinical information system requires modification of the institution's long range strategic plans and its personnel's behavior. The changes warrant a concerted effort on the part of many different individuals; this paper describes the role of the Information Architect whose primary functions are to steer the process to fulfill stated objectives and build consensus where divergent forces are at work. The workings of the Architect is presented in context of a unique Middle-Eastern institution currently undergoing automation of clinical information.

INTRODUCTION

There are a myriad of reasons which have been described in the literature, why accessing and interpreting clinical or administrative data is difficult. With the development of computers in the late 1940s and early 1950s, many early informatics pioneers began describing and experimenting with computer-based medical record systems. During these past 40 years many systems have been designed and implemented with mixed results. Less successful experimental results were usually blamed on either insufficient computational power, inadequate storage capability, or lack of support from hospital administration. More recently, informaticians have begun to recognize the vital role that clinicians and administrators must play in the design, development, implementation, and maintenance of these complex integrated clinical information systems¹.

This paper describes how one institution in the Middle East is positioning itself to meet these challenges. It begins with a brief overview of the current environment at King Faisal Specialist Hospital & Research Centre (KFSH&RC). It then describes the role that are created for the Information

Architect. The final section describes the goals for the upcoming year and discusses some of the key challenges.

BACKGROUND

The KFSH&RC is a 517-bed tertiary care medical center located in Riyadh, Saudi Arabia. It provides a variety of advanced diagnostic and therapeutic services to the entire country including: open-heart surgery, bone marrow transplants, and liver transplants.

The Saudi/U.S. University Project

The Saudi/U.S. University Project is a multi-faceted medical project designed to enhance the patient care services delivered at KFSH&RC. It was established between the Government of Saudi Arabia and several leading U.S. Universities (Baylor, Duke, George Washington, Virginia and Yale). The major areas of emphasis in the project are clinical services, education and training - particularly of Saudi nationals - and research.

In September 1993, a team of physicians, computer scientists, and informaticians from four U.S. Universities visited KFSH&RC in order to develop a plan for integrated information technology and telecommunications. Their goals were to 1) develop the necessary computing and communications infrastructure to support excellence in clinical care, medical education and research; 2) position KFSH&RC as a showcase for integrated information technology in the country and the entire Middle East; and 3) establish the medical center as the premier site for information-based patient management in the Middle East. Towards this end they identified six key components required to achieve these goals: 1) institutional commitment to information technology; 2) technical and managerial leadership of the enterprise; 3) establishment of a high-performance data network; 4) recruiting, training, and empowering people; 5) selection of a

database standard; and 6) tailored applications to meet the institutions needs².

In the year and one-half since this site visit, much progress has been made. Specifically, a state-of-the-art satellite-based telemedicine facility has been established and put into routine use. Second, a request for proposal (RFP) describing a medical center-wide voice and data communications infrastructure based on Asynchronous Transfer Mode technology has been submitted to the vendors for evaluation and bidding. Finally, the clinical information architect position has been created and filled (THP, SS, DFS)³. These individuals have served to increase the awareness of the clinical staff regarding the potential application of advanced information management technology to the practice of medicine. While much has been accomplished, much remains to be done.

THE ROLE OF THE INFORMATION ARCHITECT

The Information Architect (IA) works closely with the information technology department and hospital clinicians. He is responsible for ensuring that hospital personnel collaborate efficiently and productively to design clinical and administrative applications and resolve relevant system design issues. This requires educating, convening, and supporting clinical and administrative work groups, e.g., providing them with relevant information regarding products, applications, and implementation issues. The IA acts as a resource for the clinical, administrative and information technology departments and facilitates/manages interdisciplinary and/or inter-departmental projects having significant information management implications. The IA acts to assure that medical center information requirements are satisfied to the maximum degree possible given financial, technical and other constraints, and that opportunities for cost-beneficial applications of information management technology are not missed.

As Figure 1 illustrates the job of the IA is made even more difficult by the fact that three main groups (the medical staff, the hospital administration and the information technology) in any hospital are often working with different long-term goals, day-to-day pressures, and vocabularies.

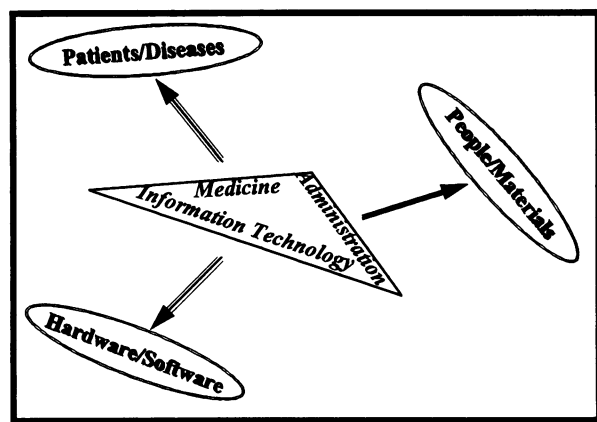


Figure 1. Divergent goals of three groups.

The job of the IA is to help these three groups understand that they are all working toward the same goal: Improving the quality of patient care while reducing its costs. He does this by looking across functional work areas to 1) integrate and synthesize raw data to 2) create information which enables 3) improved clinical decision-making and hence an 4) improvement in patient outcomes and reduced costs.

Table 1 serves to further illustrate the different stereotypic views which these three groups often have. Each column highlights some of the major concerns, or hidden agendas, of each group. Each row depicts how each group fundamentally views similar topics.

Table 1. Stereotypic views of each group.

<i>Medicine</i>	<i>Administration</i>	<i>Information Technology</i>
Patient care	Patient cost/revenue	Patient records
Procedures	Supplies	Transactions
Generates and reviews medical data	Generates and reviews financial data	Builds DBs, GUIs, PCs, networks
Generates money	Controls money	Invests money to reduce costs

We believe that the IA should work in close collaboration with an experienced technical manager. It is asking too much for one individual to have the technical, clinical, interpersonal, and managerial skills (not to mention the time) required to lead the organization's long range clinical information management planning activities, communicate with the clinical staff regarding these plans, and manage the day-to-day operation of a

state-of-the-art data processing facility. Moreover, the clinical, technical, and interpersonal skills required, once obtained, should not be squandered on mundane (although crucial to the organizations success) managerial tasks which are best delegated to an individual specifically trained in this area.

The following paragraphs outline the principal duties of the IA at KFSH&RC in roughly their order of importance and then provide some justification for each point.

1. Communicate with clinical and administrative staff throughout the institution regarding projects and provide current information and advice to help set priorities on all issues related to medical informatics in periodic verbal and written reports.

The ability to communicate with a wide range of individuals within the organization (both vertically and horizontally) is a key ingredient in developing and implementing the widespread (technical, clinical, and cultural) changes which are required to meet the information management demands of the modern health care environment.

2. Develop a medical informatics vision and strategy for the Hospital that meets the needs of clinicians and administrators, and promote the use of information technology.

The vision and strategy allows previously isolated and distributed decision-making and resource allocation to augment the integrated system rather than increase its fragmentation.

3. Identify instances when information technology can improve clinical and administrative processes and/or patient outcomes, and work with all concerned to implement the appropriate technology.

Many organizations are proud to say that they "respond to customer needs." In the rapidly changing area of information technology, one must anticipate customer needs if they are to be successful. Therefore, the IA must be close enough to the customers (clinicians) and knowledgeable enough about the latest technologies that he can improve critical work processes before most users even notice a problem.

4. Identify, investigate and propose solutions to problems with information management that adversely affect patient care. Negotiate with all interested parties in the Hospital to develop strategies and or policies that resolve any problems identified.

Many times the information management technology (*i.e.*, the computer) is identified as the culprit in clinical and/or administrative problems which arise when a new system is installed. Rather it is the computer system which serves to highlight an existing problem⁴ and/or provides the data that allows previously unforeseen problems to be identified⁵. The IA must be able to help change ineffective hospital policies, the work patterns of clinicians, and/or the computer system to improve the situation. Additionally, he may help in reorganizing work flows, responsibilities, and organization structure, specially within the information technology department⁶.

5. Organize, lead and report on the activities of the physician group active in information systems issues.

As a member of the information technology department within the hospital, the IA must constantly reinforce the central idea to his colleagues: Information technology must be used to support the clinical activities of the hospital, not just for the sake of using new technology. Therefore, the formation of an active group of clinicians who are interested in working with the information technology department to design, develop, implement and maintain the information management environment.

6. Formulate and draft needed departmental and hospital policies for management of clinical information.

The wider availability of patient demographic and clinical data combined with the ability to rapidly search through enormous numbers of medical records using computers makes the development of policies for the management of confidential patient information vital.

7. Maintains knowledge of major clinical database and electronic patient record applications, and communicates such information to hospital committees as appropriate.

Keeping abreast of the latest advances in information technology is vital if one is to anticipate dynamic clinical user needs.

8. Prepares educational materials on computer systems; develops and supports training programs for users of clinical applications.

Staff training is one of the most often overlooked problems. By exploiting tools effectively through education, the users can extract maximum benefit out of the information technology.

9. Makes recommendations on user interface design, report requirements and formats, and data and communication standards for clinical reporting.

The importance of maintaining a common user interface throughout the institution can not be overstated. In addition, the utilization of existing network, communication, and data transfer standards⁷ is imperative.

10. Participate in the planning, installation and training for any new information management tools in the clinical area.

In any vibrant academic medical center there will always be small groups of innovative clinicians who are constantly experimenting with new computer-based clinical tools. It is important that someone from the information technology department is aware of these experiments, and, if possible, available to help them integrate these tools into their regular work routine as well as into the larger information system.

11. Participate as needed in hospital committees (both standing and *ad hoc*) requesting or requiring medical informatics expertise.

Often large computer-related hospital projects are undertaken without the prior knowledge of the information technology department. When changes and/or routine maintenance are needed they are hastily called in at which point they are quite unprepared from both a technical and staffing standpoint for the given task. The key to the problem is to participate in decision processes in a proactive manner.

At KFSH&RC, it is understood that the duties of the IA by themselves do not represent a successful

transition into the information world for an institution; many other critical factors exist. Other methodologies are available to address the complex problem of information management⁸. Furthermore, the special nature of KFSH&RC, similar to other locations that are geographically distant from the current informatics thinking⁹, also contributes to unique situations. Nevertheless, the role of the IA is crucial at KFSH&RC in order to successfully build a comprehensive, integrated information system. Appropriate results of the success and/or failure of the IA functions, however, can be presented only after a substantial period of time (3-4 years) during which progress is made to improve the information management in the institution.

Goals for the Information Architect

Mission statement and Vision strategy. At KFSH&RC, a process synthesized from experiences gained in several similar projects at major academic medical centers in the USA^{10,11,12} is in use to articulate the mission statement. First, the upper level hospital management and influential clinicians were informed about the potential benefits of an integrated clinical information system. The strengths and weaknesses (or opportunities for improvement) of the present information management environment were evaluated. Out of this process, the mission crystallized: Effective and efficient use of information technology to provide better health care at reduced cost for the people of Saudi Arabia.

Prototype Clinical Information System. Designing, developing, and implementing a complete integrated clinical information system (CIS) is still not a solved problem¹³. In addition, most hospitals are not in the position (financially, technically, or culturally) to undertake such a complex software engineering project in house. Therefore, we are developing a rudimentary prototype CIS to help clinicians and administrators alike understand how such a system could be used to support clinical, administrative, educational and research needs. Towards that end, we are developing the clinical data repository on an IBM RS/6000 (AIX 3.2) using the DB2/6000 relational database engine. We are utilizing Healthcare Communications, Inc.'s HCI-LINK, an integration engine, to build interfaces to existing Admit/Discharge/Transfer, Laboratory, Pharmacy, Radiology, and Transcription systems. We are creating the graphical user interface (GUI) using Powerbuilder 4.0. The first application we plan is a

review of discharge summaries, operative notes, radiology reports and medical evaluations. These items were chosen first since they are currently the only data which currently exists in electronic form, but which is not available for review via the network.

International Medical Informatics Seminar Series. There is a critical need for the exchange of information and techniques with respect to both social (*i.e.*, how do we get clinicians to use the system) and technical (*i.e.*, how do we best utilize available technology to satisfy user demands) issues. Towards that end, one of the first achievements of the Saudi/U.S. University Project was the establishment of a satellite-based Internet connection and teleconferencing facility. Using both of these communication media we have established an international medical informatics seminar series between KFSH&RC, Yale and Duke Universities. In addition, we hope to exchange videotaped seminars with several other institutions world-wide. Following these audio-visual presentations, we plan on having on-line, asynchronous group discussions using the *sci.med.informatics* Usenet newsgroup¹⁴.

CONCLUSIONS

There are many different constituencies, and hence views, which must be considered when attempting to introduce an integrated clinical information system in any large hospital. While the costs associated with the hiring of a highly qualified individual as the IA is high, we believe that without a full-time, on-site person the difficulty of the task increases to the point of becoming nearly impossible.

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